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(54) Personal Health Care Device

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ABSTRACT OF THE DISCLOSURE

A hand-held personal health care device for the polishing of teeth wherein the appliance containing the cleaning agent is driven in an oscillatory manner.

PERSONAL HEALTH CARE DEVICEBackground of the Invention

The benefits to health derived from the continual periodic cleansing of teeth by an individual has been clearly demonstrated over the years. In order to obtain these benefits, the selection of an appropriate type of personal health care device to provide the desired cleansing and polishing effects has been found most important.

The combined utilization of bacteria disturbing vehicles for use at and below the gum line, such as dental tape and floss, along with a thorough cleansing and polishing of the exposed surfaces of the teeth are now generally accepted by the professionals in the dental field as providing the best practical care. While the conventional toothbrush is the most common personal device employed, the dental professional utilizes a flexible rotating cleansing-polishing appliance which contains the cleansing agent therein. Numerous attempts have been made to provide a similar hand-held device for individual usage at locations remote from the specialized equipment and drive mechanisms which are common to the professional office.

Size and shape of the device are primary considerations since the operative end must be capable of manipulation throughout the mouth in order to contact the exposed surfaces of the teeth. In addition, dental care devices require that the portion containing the particular appliance for the task at hand be angled with respect to the axis of the main body of the device in order to insure that the appliance effectively contacts the multiple faces of the teeth.

At present, the need for slim line, hand-held personal health care devices has generated a family of



1 products capable of providing a cleansing and polishing  
2 effect and which is intentionally made small for inser-  
3 tion into the oral cavity and angled from the body of the  
4 device to facilitate hand manipulation by the individual  
5 unskilled user. One such device is disclosed in my  
6 prior U.S. patent No. 3,921,298 wherein continuous rota-  
7 tional motion via flexible drive means of an appliance  
8 provides polishing and cleansing functions.  
9

10 One common problem in the design of these small  
11 devices with tapered angled operative ends is the accom-  
12 modation of a motion translating mechanism in the small  
13 cross-sectional area available. The hand-held device  
14 typically utilizes an electric motor connected to either  
15 an internal or external power supply with a rotating  
16 shaft extending axially within the housing. In applica-  
17 tions wherein continuous rotational movement of the ap-  
18 pliance is the desired end, it is known to provide a flex-  
19 ible belt and pulley drive mechanism within the narrow  
20 confines of the angular operating end. In the operation  
21 of this type of device for home usage, the operating  
22 conditions are not controlled by professionally-trained  
23 staff and the varying pressures applied by the user often  
24 lead to undue heat generation at the tooth surface, in-  
25 ternal belt slippage and a frequent need to replace the  
26 belting. While the flexible belt drive is found satis-  
27 factory under many conditions it provides continual  
28 rotational movement of the appliance. While this type  
29 of movement is acceptable under controlled conditions,  
30 an individual operator failing to turn the device off  
31 while it remains within the oral cavity causes residual  
32 matter on the appliance to fly about the area.  
33

34 Accordingly, the present invention is directed  
35 to a personal health care device for use by individuals  
36 wherein the small cross-sectional area of the operating  
37 end includes an oscillatory drive mechanism. In addition,  
38 the appliance is located proximate to the small end

1 region of an angled operating end to facilitate manipu-  
2 lation by the user. Further, the oscillating drive  
3 mechanism provides a positive direct linking between the  
4 internal drive and driven means to substantially elimin-  
5 ate internal slippage and reduce the need for the replace-  
6 ment of parts therein.

7  
8 Summary of the Invention

9           The present invention relates to a personal  
10 health care device for use by individuals without the  
11 direct supervision or control of professional staff. The  
12 device is especially well-suited for use in polishing and  
13 cleaning the exposed surfaces of teeth.

14  
15           The device includes a containment means for  
16 housing a drive mechanism and has an operative end of  
17 small cross-sectional area and a hand-grippable body  
18 portion. The operative end is constructed so that at  
19 least a portion thereof is angled with respect to the  
20 axis of the body for enhancing the efficacy of the device.

21  
22           A power drive means is mounted within the con-  
23 tainment means and either an external electrical connec-  
24 tion can be provided or rechargeable battery operation  
25 can be utilized. The nature of the power supply can be  
26 selected by the type of usage expected. The power drive  
27 means includes an output shaft which rotates upon actua-  
28 tion of suitable control means and extends substantially  
29 axially along the body portion of the containment means.  
30 A drive means is mounted for rotation about a first axis  
31 within the operating end and is operatively coupled to  
32 the output shaft.

33  
34           Also, the operative end includes driven means  
35 mounted therein for rotation about a second axis. The  
36 driven means has an engaging means affixed thereto which  
37 extends outwardly of the operative end for removably  
38 receiving an appliance thereon. A non-planar connection

1 means is coupled to both the drive and the driven means  
2 to permit incorporation within the angled operative end.  
3 In addition, the connection means is coupled to impart  
4 oscillatory motion to the driven means. This is accom-  
5 plished by coupling one end of the connection means to the  
6 drive means a first distance from the first axis while  
7 coupling the opposing end to the driven means a second  
8 distance from the second axis. The first distance is  
9 less than the second distance so that a 360 degree rota-  
10 tion of the drive means in response to the drive shaft  
11 results in an oscillatory movement of the driven means  
12 about the second axis.

13  
14 The engaging means affixed to the driven means  
15 is therefore provided with an oscillatory movement. The  
16 engaging means which extends outwardly of the operative  
17 end via a suitable bushing is provided with an expanded  
18 diameter end for removably receiving an appliance, typi-  
19 cally a conventional cleansing-polishing cup with a rib-  
20 bed external cavity for receiving paste material to be  
21 applied to the surfaces of the teeth.

22  
23 Further features and advantages of the invention  
24 will become more readily apparent from the following de-  
25 tailed description of specific embodiments of the inven-  
26 tion when taken in conjunction with the accompanying  
27 drawings.

#### 28 29 Brief Description of the Drawings

30 Fig. 1 is a view in perspective of one embodi-  
31 ment of the invention.

32  
33 Fig. 2 is a side view of the embodiment of  
34 Fig. 1.

35  
36 Fig. 3 is a top view in section taken along  
37 line 3-3 of Fig. 2.

1 Fig. 4 is a side view in section taken along  
2 line 4-4 of Fig. 3.

3  
4 Fig. 5 is a side view in section similar to  
5 Fig. 4 of another embodiment of the invention.

6  
7 Description of the Preferred Embodiment

8 Referring now to the embodiment of Figs. 1 and  
9 2, a personal health care device 10 is shown including  
10 containment means 11 having a hand-grippable body portion  
11 12 with external switch button 23 and an operating end 14  
12 of reduced cross-sectional area. The opposing end of  
13 containment means 11 is provided with external electrical  
14 connection 15 having a flexible waterproof reinforcing  
15 section 16 provided adjacent the containment means. How-  
16 ever, the external a-c connection may be replaced by  
17 internal battery means as the power supply with conven-  
18 tional recharging receptacles provided for the external  
19 connection. The containment means is formed in upper  
20 and lower sections as indicated by parting line 18 in  
21 order to permit assembly and testing prior to forming the  
22 sealed unit. This feature provides distinct manufactur-  
23 ing advantages.

24  
25 At the end of operating end 14, a region 22 of  
26 substantially reduced cross-sectional area is angularly  
27 displaced in an upward direction from the longitudinal  
28 axis of the body portion 12. This orientation of the  
29 portion of the device placed within the oral cavity of  
30 the user facilitates the manipulation of the device by  
31 the user to permit the contact of appliance 20 with the  
32 variously oriented surfaces of the teeth. The combina-  
33 tion of small cross-sectional area and angular displace-  
34 ment in the operative end have heretofore tended to limit  
35 the types of drive mechanisms available for use therein  
36 while favoring the use of flexible belt drives and their  
37 360 degree rotational drive of the tip-mounted accessory  
38 20. The present invention utilizes a novel drive assembly

1 which is readily accommodated in this type of containment  
2 means and provides a different drive motion for the acces-  
3 sory 20.  
4

5           The accessory 20 is generally a flexible cup  
6 containing internal ribs or vanes within the cup. In  
7 operation, a cleansing-polishing agent is added to the  
8 cup and the cup is placed in contact with the surface of  
9 the teeth. Heretofore, the 360 degree rotation of such  
10 accessories has placed the burden on the user to actuate  
11 the device after it is within the oral cavity to prevent  
12 the agent from being sprayed about. This result has tend-  
13 ed to reduce consumer acceptance of devices of this type.  
14 The present invention providing an oscillatory motion of  
15 the accessory 20 does not generate this undesirable  
16 result nor does it create the heat of a continually rot-  
17 ating head which often leads to user discomfort.  
18

19           The manner of affixation of the accessory 20  
20 to the engaging means is not apparent from viewing Figs.  
21 1 and 2 since, in operation, a flexible sleeve or boot 21  
22 is provided between the accessory and region 22 of the  
23 operative end. The sleeve frictionally engages the ex-  
24 tended portion of the operative end as well as the exten-  
25 sion of the shaft of the oscillatory engaging means which  
26 extends from the device, as shown in detail in Fig. 4.  
27 The sleeve assists in establishing a water-tight device  
28 and can be utilized because the output motion of the  
29 device is oscillatory rather than complete rotation. The  
30 provision of this barrier is important not only from a  
31 safety standpoint but also to the operating lifetime of  
32 the device since cleansing-polishing agents are abrasive  
33 by their nature and their migration into the workings of  
34 the drive mechanism has been found to result in damage  
35 to the mechanism.  
36

37           The drive mechanism is shown in detail in the  
38 partial sectional view of Fig. 3 wherein the upper section



7

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1 of containment means 11 is removed to provide a view of  
2 the interior of the operating end 14. The power drive  
3 module 36, typically a d-c electrical motor, has an out-  
4 put shaft 25 which axially extends into the operating end  
5 and is provided with support plate 26 having circular  
6 gear 27 affixed thereto. The actuation of the power drive  
7 module results in the rotation of gear 27.

8  
9 The power drive module 36 is provided as shown  
10 with internal threads for receiving the external threads  
11 35 of the operating end. The ability to use the power  
12 drive module with other operating ends for multiple user  
13 capability is present. In other embodiments of the inven-  
14 tion, the operating end and the power drive module can  
15 be made integral if desired. In addition it should be  
16 noted that the extension of the drive shaft 25 into the  
17 operating end is preferred, however the power drive module  
18 can incorporate the entire output shaft and circular gear  
19 27 if desired.

20  
21 As shown, the drive means in the operative  
22 end includes the gear 28 centrally mounted on a substan-  
23 tially vertical axis and having upstanding gear teeth  
24 which mesh with the teeth of circular gear 27. Consequent-  
25 ly, the rotational drive from the power module is trans-  
26 lated through an angle of ninety degrees. Horizontal  
27 gear 28 is provided with a raised central portion 29  
28 upon which one end 32 of the connecting link 30 is movably  
29 mounted for rotation in a horizontal plane. The end 32  
30 is mounted on the raised portion 29 at a point spaced  
31 from the vertical rotational axis on gear 28. As gear 28  
32 is driven through a complete rotation, the end of the  
33 connecting link moves about a circular path having a  
34 radius equal to the distance between the mounting and the  
35 axis of rotation of gear 28.

36  
37 Driven means 34 is shown as a disc and is mount-  
38 ed for rotation about a central off-vertical axis, shown

1 more clearly in Fig. 4. The opposing end 33 of the connect-  
2 ing link 30 is rotatably attached at the upper surface of  
3 driven means 34 at a distance from the axis of rotation  
4 thereof. This distance is greater than the spacing of  
5 end 32 from the axis of rotation of gear 28 so that one  
6 revolution of gear 28 results in end 33 and driven means  
7 34 transversing an arc of less than 180 degrees. In  
8 the preferred embodiment, the ratio of the distances for  
9 the ends 32 and 33 of link 30 is made such that the driven  
10 disc 34 traverses and arc of about 120 degrees. One  
11 revolution of gear 28 provides two traverses of the arcuate  
12 path or one oscillatory cycle for the disc 34.

13  
14 In Fig. 4, the gear 27 on the output shaft is  
15 shown meshing with gear 28 mounted for rotation about a  
16 vertical axis defined by shaft 40. The shaft 40 is  
17 normally press fit into a mounting sleeve 41 bonded to  
18 or molded in the underside of the operating end 14. The  
19 gear 28 contains an integral raised central portion at  
20 the top of which is rotatably pinned the end 32 of con-  
21 necting link 30. Pin 39 is shown offset from the verti-  
22 cal axis of gear 28 as defined by shaft 40.

23  
24 The opposing end 33 of connecting link 30 is  
25 movably coupled to the top surface of driven disc 34 by  
26 pin 44. The coupling pin is spaced from the axis of  
27 movement of the disc as defined by shaft 42 by a distance  
28 greater than the offset spacing of end 32. In order to  
29 accommodate the combination of drive gear, driven disc  
30 and connecting link within the angled cross-sectional  
31 area of the operating end 14, the rigid connecting link  
32 is non-planar with the opposing ends essentially per-  
33 pendicular to the axes of rotation of the drive gear and  
34 driven disc. The axes are non-parallel due to the angu-  
35 lar displacement of region 22. The portion of the connect-  
36 ing link between the opposing ends is shown comprised of  
37 two non-planar segments oriented to provide the coupling  
38 for transmittal of the force. Other configurations of

1 the central portion of the link may be utilized if desired.

2  
3 The shaft 42 of the driven disc 34 is journalled  
4 in a split sleeve bearing 46 which is affixed to the  
5 perimetrical surface of a hole formed in the underside  
6 of the operating end. The disc is preferably made inte-  
7 gral with the engaging means for receiving the appliance  
8 20 and is shown affixed to the end of shaft 42 which  
9 terminates at its outer end in expanded diameter portion  
10 48. The flexible accessory is urged onto the engaging  
11 means by forcing its receiving end over portion 48.

12  
13 Also, shaft 42 has an intermediate section 49  
14 of large diameter serving as a thrust plate with a con-  
15 cave peripheral surface. Adjacent section 49 is the  
16 bearing 46 for shaft 42 so that axial movement of the  
17 driven disc and the engaging means is limited. A housing  
18 47 for bearing 46 is placed over the engaging means and  
19 moved upwardly to be fastened to both the outer surfaces  
20 of the operating end and the bearing 46. The housing  
21 47 is shown having a centrally located concave peripheral  
22 portion.

23  
24 The cylindrical sleeve 21 formed of a water  
25 impermeable material serves as a water-tight boot that  
26 prevents the entrance of the cleansing-polishing agent  
27 into the operating end of the invention thereby substan-  
28 tially increasing the service life of the device. The  
29 boot can be independently replaced by removing the appli-  
30 ance 20 and sliding the new sleeve over the concave por-  
31 tion 49 of the engaging means onto the housing 47 and  
32 its concave portions. The nature of the oscillatory  
33 motion of the shaft 42 permits the use of a tight flexible  
34 sleeve to cover bearing joints as contrasted with the ex-  
35 posed joints found in fully rotational equipment.

36  
37 The use of a longitudinally divided contain-  
38 ment means permits the installation and testing of the

1 components of the invention prior to sealing. The mount-  
2 ing of the power drive means and the associated switch  
3 in the containment means can be selected by the manufac-  
4 turer in accordance with the type of drive motor and  
5 power source favored. Reference to external connections  
6 in hand held appliances may be found in my U.S. patent  
7 3,921,298 issued November 25, 1975.

8  
9 A second embodiment of the invention is shown  
10 in Fig. 5 with like parts having the same reference num-  
11 erals. This embodiment utilizes a threaded split bearing  
12 46' which is placed about shaft 42 and threaded into  
13 receiving housing 47' molded as a portion of the operating  
14 end. The insertion of the piece part takes place from  
15 the top prior to the affixation of the top portion of  
16 the containment means. A thrust plate 50 is located on  
17 the shaft 42 to limit axial movement. The shaft termin-  
18 ates in an expanded diameter portion 48 which receives  
19 the appliance to be driven. The connection of the driven  
20 disc to the drive gear is the same for each embodiment.  
21 If desired, a flexible boot can be provided by the use  
22 of a right-angle sheath extending over the end and  
23 contacting the sides of the thrust plate 50.

24  
25 While the above description has referred to  
26 specific embodiments of the invention, it is recognized  
27 that many variations and modifications may be made there-  
28 in without departing from the scope of the invention.  
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1 CLAIMS

2 1. A personal health care device comprising:

3 a) containment means for housing a drive  
4 mechanism therein and having an operative end and a body  
5 portion;6  
7 b) power drive means mounted in said con-  
8 tainment means and having an output shaft extending  
9 therefrom, the actuation of said power drive means pro-  
10 viding rotation of said output shaft;11  
12 c) drive means mounted for rotation about  
13 a first axis at an angle to the axis of said output shaft  
14 and operatively coupled thereto;15  
16 d) driven means mounted in said operative  
17 end for rotation about a second axis at an angle to the  
18 axis of said output shaft;19  
20 e) an elongated rigid link coupled to said  
21 drive means a first distance from said first axis and  
22 coupled to said driven means a second distance from said  
23 second axis, said first distance being less than said  
24 second distance whereby rotation of said drive means  
25 imparts an oscillatory motion to the rotation of said  
26 driven means;27  
28 f) engaging means affixed to said driven  
29 means and extending outwardly of said operative end for  
30 receiving an appliance thereon.31  
32 2. The device of claim 1 wherein at least a  
33 portion of said operative end is angled from the body  
34 portion of said containment means.35  
36 3. The device of claim 2 wherein said engaging  
37 means extends outwardly of the angled portion of said  
38 operative end.

4. The device of claim 3 wherein said engaging means comprises an expanded diameter end for removably receiving an appliance thereon.

5. The device of claim 4 further comprising sealing means coupled between said engaging means and the operative end of said containment means.

6. The device of claim 5 wherein said sealing means is a flexible sleeve frictionally engaging the operative end of said containment means and said engaging means.

7. The device of claim 6 wherein said elongated rigid link is non-planar and comprises first and second end segments substantially parallel with the drive means and the driven means respectively and a connecting segment therebetween.

8. The device of claim 3 further comprising a bearing means affixed to the angled portion of said operative end for rotatably receiving a portion of said engaging means therein.

9. The device of claim 8 wherein said bearing means comprises a section of reduced diameter and said engaging means has a section of reduced diameter, said sealing means being frictionally coupled to said sections of reduced diameter and extending therebetween.

10. The device of claim 9 wherein said elongated rigid link is non-planar and comprises first and second end segments substantially parallel to the drive means and the driven means respectively and a connecting segment therebetween.

11. The device of claim 10 wherein said first and second axes are non-parallel with respect to each other.

12. The device of claim 11 wherein the operative end of said containment means is removably affixed to the body portion thereof, said power drive means being mounted in said body portion and having the output shaft extending therefrom.

13. A personal health care attachment having an operative end and a securing end for use with a power drive module having an externally accessible power drive means, said attachment comprising:

a) means for removably affixing the securing end of said attachment to the power drive module;

b) drive means mounted for rotation about a first axis at an angle to the axis of said power drive means and operatively coupled thereto;

c) driven means mounted in an operative end of said attachment for rotation about a second axis at an angle to the axis of said power drive means;

d) an elongated rigid link coupled to said drive means a first distance from said first axis and coupled to said driven means a second distance from said second axis, said first distance being less than said second distance whereby rotation of said drive means imparts an oscillatory motion to the rotation of said driven means;

e) engaging means affixed to said driven means and extending outwardly of the operative end of said attachment for receiving an appliance thereon.

14. The attachment of claim 13 wherein at least a portion of said operative end is angled from the body portion of said attachment.

1           15. The attachment of claim 14 wherein said  
2 engaging means extends outwardly of the angled portion  
3 of said operative end.  
4

5           16. The attachment of claim 15 wherein said  
6 engaging means comprises an expanded diameter end for  
7 removably receiving an appliance thereon.  
8

9           17. The attachment of claim 16 further compris-  
10 ing sealing means coupled between said engaging means  
11 and the operative end of said attachment.  
12

13           18. The attachment of claim 17 wherein said  
14 sealing means is a flexible sleeve frictionally engaging  
15 the operative end of said attachment and said engaging  
16 means.  
17

18           19. The attachment of claim 18 wherein said  
19 elongated rigid link is non-planar and comprises first  
20 and second end segments substantially parallel with the  
21 drive means and the driven means respectively and a con-  
22 necting segment therebetween.  
23

24           20. The attachment of claim 15 further com-  
25 prising a bearing means affixed to the angled portion of  
26 said operative end for rotatably receiving a portion of  
27 said engaging means therein.  
28

29           21. The attachment of claim 20 wherein said  
30 bearing means comprises a section of reduced diameter and  
31 said engaging means has a section of reduced diameter,  
32 said sealing means being frictionally coupled to said  
33 sections of reduced diameter and extending therebetween.  
34

35           22. The attachment of claim 21 wherein the  
36 elongated rigid link comprises first and second end seg-  
37 ments substantially parallel to the drive means and the  
38 driven means respectively and a connecting segment there-  
between.



1           23. The attachment of claim 22 wherein said  
2 first and second axes are non-parallel with respect to  
3 each other.  
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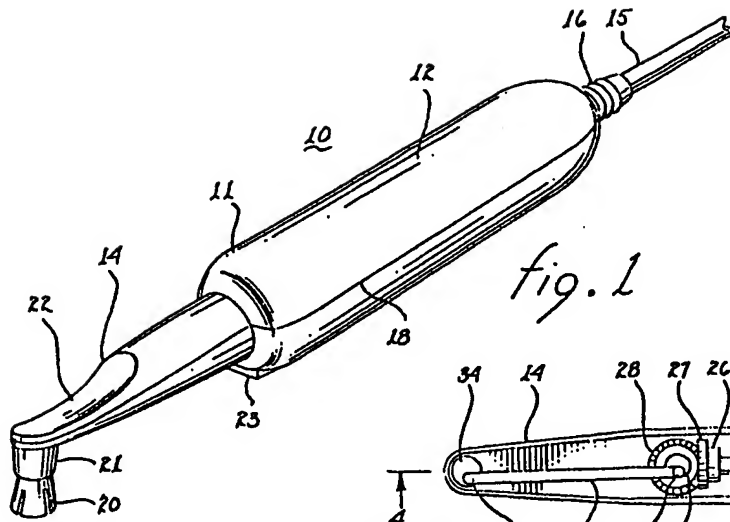


fig. 1

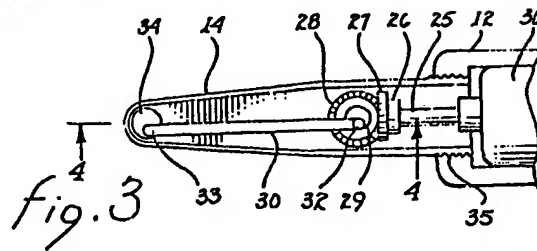


fig. 3

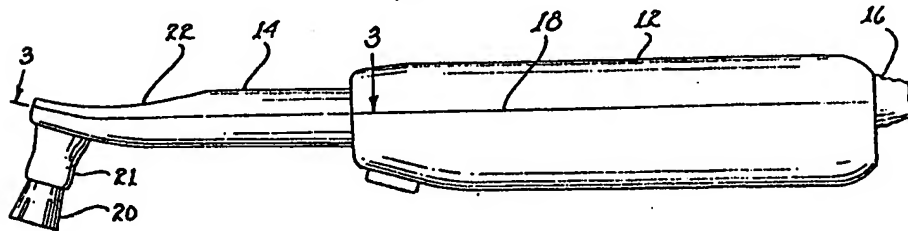


fig. 2

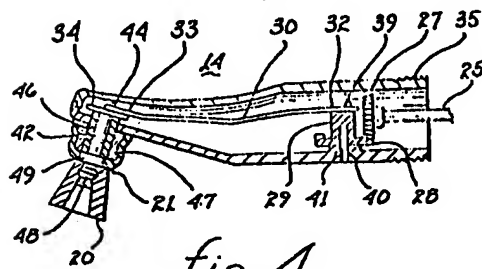


fig. 4

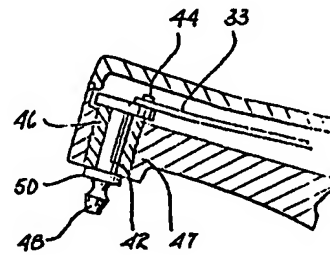


fig. 5

Chas E. Mearns